

1	Introduction	2
2	Definition of animation	3
3	Ideas & goals	5
4	Story	6
5	From Concept Art to 3D	8
5.1	Introduction	8
5.2	Concept Art	8
5.3	Storyboard	10
5.4	Animatic	10
5.5	3D	12
6	The title of the movie.....	14
7	How would you end this movie?	15
8	Animation in general	16
8.1	Animation techniques.....	16
9	Animation-theories used in our case.....	19
9.1.	Introduction	19
9.2.	Walk cycles	19
9.3.	Heels and Toes	20
9.4.	The Arms (and the secret of Break Points).....	21
9.5.	The Flexibility (The use of Breakdown).....	22
9.6	Facial Expressions	23
10	Music and sound in cartooned animation.....	25
11	Production in Maya	27
11.1	Modelling.....	27
11.2	Shaders.....	28
11.3	Light	29
11.4	Rigging.....	30
11.5	Animation	31
12	Conclusion	33
13	References	34
14	Appendix.....	35

1 Introduction

The project in animation is about producing an animated movie 1 to 5 minutes long. The only requirements are that it is supposed to be made in Maya (modelling, animation and rendering). It is though acceptable to use other programs to make effects and other things to the movie. For example Adobe AfterEffects.

Including this, we are not supposed to produce a movie with dialogue. I.e. our characters can not talk to each other and thereby help the audience to understand the plot. Sounds, music and mumbling are an option to solve this problem.

2 Definition of animation

Anima is the Japanese word for animation = something having life.

Animation is not only frame by frame, there is more into it than that.

It is an illusion of life and it is the way to make dead things live.

Good animation is to make something unique and still make a product with symbols and constituents that people recognize even if it is made with techniques less seen than others. Furthermore, good animation is made by people who have great judgement of body language and of how important movement is to achieve an optimal experience.

An example of a good animated movie is “The Tocher” by Lotte Reiniger (1938). It is made with a silhouette/cut out technique where the parts are cut out of thick black cardboard and placed on a white background.

Out of the silhouettes you get an impression of what the film is about, there is no dialogue, only music that fits the action and atmosphere.



The movie is a commercial for a post office but it is more like a fairytale, where the characters' personality is made obvious with the way they behave and are cut out.

Even though the movement do not flow as in the reality it is easy to identify yourself with the characters and it is easy to figure out who is good and who is the bad guy. All the details in the cut out give the excellent impression of thoroughness and considerations.

Lotte Reiniger has managed to deliver a product with such high quality, and the story is made interesting because of the used technique. Every fairytale have the same story more or less, and “The Tocher” is not an exception. But the silhouettes make it unique and not tiring.

The illustrations are from “The Adventures of Prince Achmed”, one of Lotte Reinigers first full-length-silhouette films. They are good examples of the great cut outs. The same kind is used in “The Tocher”.

The picture above illustrates how Lotte Reiniger has wired the characters so that the limbs and head could be easily moved.¹

Bad animation in our opinion could for example be the “Allegretto” by Oskar Fischinger (1936) which is a typical abstract film.

The movie is composed of different shapes in different colours put together with music that fits perfectly in.

This movie is well made, no doubt about that, but it seems like something that could have been made by anyone. It is easy to draw some circles and some squares and make a movie of this, but it is not the kind of animation that hits the heart, so to speak.

The difficult part of animation is to do something that people like simultaneous with the fact that it should be original.

¹ http://sweb.cityu.edu.hk/smash/5304/cut_out.html

3 Ideas & goals

The purpose of this paper is to clarify the definition of animation, and to explain and show how to produce an animated movie.

It was our goal to test our skills within animation and storytelling, and it has been a challenge to figure out an understanding story with the fact that there could not be any dialogue involved.

Therefore, we used a lot of time to get the story in place with the right camera-shots and the right composition of the whole movie.

The first storyboard gives a great idea of our thoughts and the plot of the story in an early state of the project. The next is a bit more detailed than the first one and we have from this made an “animatic” storyboard, which is the whole movie in rough drawings with a bit alternative sound. (The animatic is placed on the enclosed cd.)

In the light of this so called animated storyboard we have tried to produce our animated movie. The story is told in the “Story”-section page 6.

The idea of our movie is that we want to explain a serious topic in a different, but at the same time, funny way. It has from the start been our intention to produce a movie with a kind of serious moral. But the more difficult part was to find out how to do it and in which genre. It is not supposed to be a boring serious story, so in spite of this we agreed to make it as a cartoon in a non-realistic atmosphere.

4 Story

The story of our animation is about the life in a refrigerator and what happens when a different being gets a part of the “life” inside.

A corn cob is put in a refrigerator, but what the others do not know is that the corn cob is gene-modified, and thereby has a longer life, so to speak.

When the corn cob is put inside the “world” the other residents are very curious of what is happening. They are so happy to see new life that they take the elevator down to wish him welcome.

The corn cob follows the tomatoes to the upper floor, and he shows off with his strength and big muscles.

At the top floor the tomatoes have a sort of playground. They have a green bouncy pudding to jump on, and they use it to turn on the lights in the refrigerator. On the occasion of the corn cob’s arrival they play and jump around. But when it is the corn cob’s turn to try it out, something awful happens.

As the corn jumps he bounces so high that he gets his head in the ventilator. It chops off his head and he falls to the ground.

The tomatoes are very scared and sad once they see the corn lying immovable, but they got very frightened when they now notice, that the corn cob is healing himself.

The consequence of this scenario is that all of the vegetables get angry and dooms the corn to “his own” floor at the bottom of the refrigerator.

The corn gets sad and travels to his own floor, where he lies in a few days, until he hears something weird going on above him, and suddenly he hears a loud scream.

The corn cob gets curious and travels up to the others to see what is happening. When he gets out of the elevator he spots the vegetables gathered around the pudding.

It turns out that one of the tomatoes is stuck in the pudding and can not get out. The others are getting old and are not strong enough to pull him out.

It is now a good thing that the corn cob lives in the refrigerator, because he comes to the tomato's rescue. He pushes them all to the side and pulls the little tomato out of the pudding.

The vegetables are very glad that the corn cob helped them, and they want to start all over and to be his friends again.

The sad thing for the corn cob in this story is that, as the time goes by, all his friends get old and dies or they get eaten. He watches all his friends get old while he does not even grow older at all.

He is again alone with no friends, and he does not even bother to get to know the new incomings, because he is aware of the consequences. That is, he will also loose these in time.

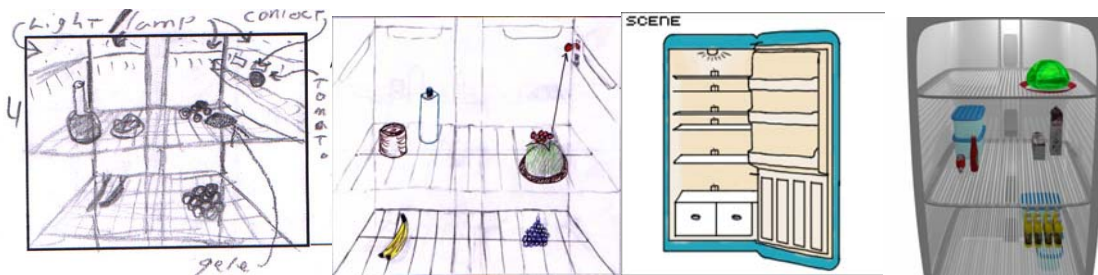
He lives in his own little lonely world and the one thing on his mind is, when he gets out of this nightmare.

Every time the refrigerator-door opens he hopes to be taken out, but it does not happen until one day he least expect it.

He hears a squeak from the door and suddenly a strong white light covers him. A hand grabs him and the corn cob seems happy! It is now up to the audience to figure out his destiny.

You can then ask yourself: What is the point of living forever, when all your dearest friends and family do not?

5 From Concept Art to 3D



Development of the refrigerator. (Enclosed on the CD)

5.1 Introduction

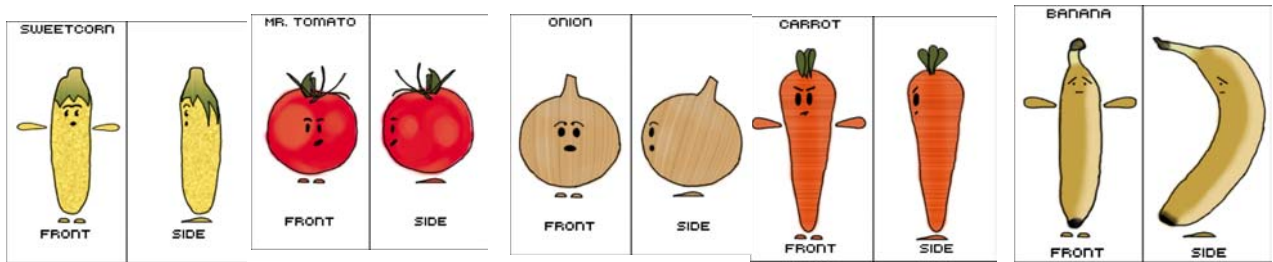
The inspiration to our characters did we get from the movie “Bert” by Moonsung Lee, (Is put on the enclosed CD). The way these characters are drawn is a very simple way with their feet and arms drawn separated from the rest of the body. The eyes and mouth is also very simple, but yet the animator did achieve his supposed goal for the audience to understand the point.

When we first had our story in place, we could begin the concept art. We made different drawings of how we imagined each of the characters should look like. However, various opinions about the characters led to discussions among the group members. We had some problems defining the main character, the corn cob.

5.2 Concept Art

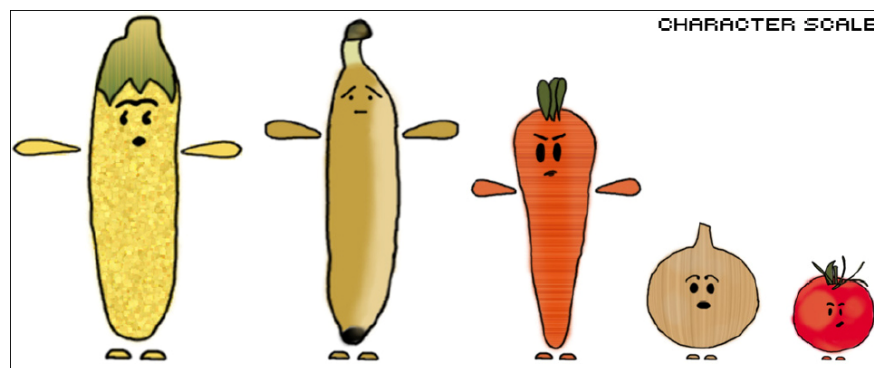
At the beginning, we all agreed to make the main character a cucumber. But as the drawings went by, we agreed to change this character. The reason was because of the texture. –The cucumber looked too much like the other characters in texture and colour. Therefore we decided to change the main character to the corn cob.

The corn cob, have a bright (but not flashy) yellow colour, it have corns which means stomas for texture. This helped with a perceptual separation, from the other characters. It also helps to show the audience that the corn cob is the character to notice, and the other characters are kind of secondary to the story. The other characters have a smooth surface, and their natural colour.



Examples of digital character designs.

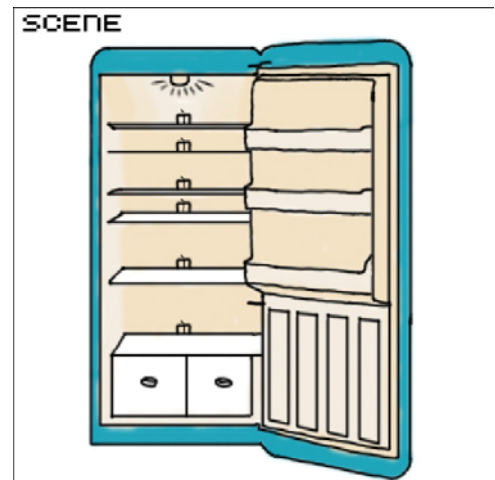
When all the character designs were in place, we drew them in Photoshop to make a digital version as well. This promoted our understanding for how to expect them to be animated. All ready at that point, we discussed different techniques in how to do them in Maya, and which methods of animation to use.



Also a scale was made, to compare the different characters.

The characters need a home, and what is more convenient than a refrigerator?

This refrigerator had to be in a recognizable design. So we drew a typically fridge with shelves and boxes in the bottom. But we needed a way for the characters to “visit” each other on the different shelves. To solve this minor problem we made an elevator in the back of the fridge. We found that it was a good way to create the social possibilities that we needed to make the story.



5.3 Storyboard

Making storyboards is a major factor in animation production. It is often easier to express yourself in pictures than by writing it down.

We have made storyboards as guidelines and as better understanding in our working process.

With the story in place, we sketched our scenes to see if it would work in practice. Each scene was drawn.



Storyboard examples

When the storyboard was done, we looked the whole thing through. We needed something different and original to spice the movie a little bit. A meeting with Hee made us change some of the camera angles and to delete some of the needless frames. This was done to make it shorter, and at the same time enhance the understanding of the story line.

The finished storyboard was used as a guideline to the animatic-production. It is possible to see the storyboard both on the CD and in Appendix 1.

5.4 Animatic

We agreed to integrate the notes with the new angles and ideas for our animatic after the evaluation of the storyboard, and we tried to make it as much according to the storyboard as possible, just more detailed. We also decided to add primitive colouring, to make a more realistic view.



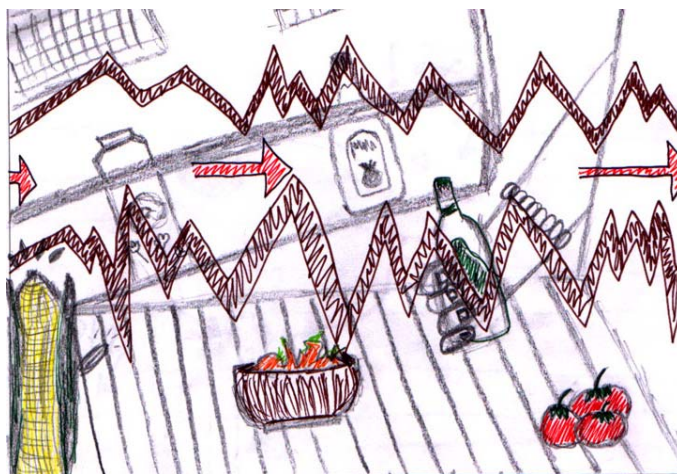
Examples from the animatic

An animatic is basically the storyboard more detailed, in a slideshow with some sound. All to get a better idea of what the story is all about.

This sounds easy, but proved to be quite a task. During the playback, we discovered some problems in the end of the animatic, which was that the ending became really difficult to understand. No one else but us understood it, and it is now easy to see why.

Looking through other people's eyes, we could see that there was something wrong. In the end of the animatic we were challenged by the fact that we had to draw a "fast forward" effect. Just like when a VCR is doing the fast forward and the picture on the TV are moving really fast with some distorted lines all over it. Not an easy job to do, because it is a movement that should be illustrated static on paper.

We agreed that this effect could be archived in the animatic, by looping four or five pictures really fast. But that would include fourteen to fifteen additional pictures, which we did not have the time to do.

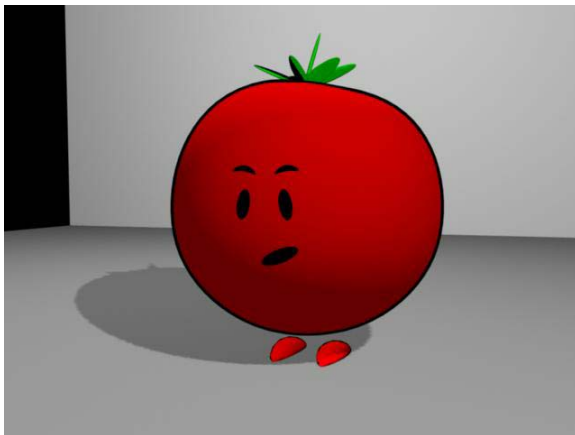


Our attempt to draw the "Fast Forward" effect.

5.5 3D

After the animatic was done, we started the 3D modelling (see the chapter “Production in Maya” page 27). Here follows a short description of our thoughts and ideas in this part of the animation process.

First the tomato character was modelled in a simple environment to test the shader we had made for it. This was done to be sure we got the wanted cartoony style. The style we wanted was, as mentioned, something like the one in “Bert”. This style is a very good looking cartoon style, but still it is focused on revealing the 3D atmosphere. Mostly the light and shadow effect reflects on the shader of the character which reveals this. Something else about the shader, is that it makes a black outline around the object, on which it is placed. This also made it look more traditional, as if it was drawn using a pen. This style is being used more and more in cartoon-series on television. “Futurama”, “Family Guy”, “Invader Zim”; are all using 3D for fast action-filled sequences. But still they retain their cartoonstyle without ruining the idea.

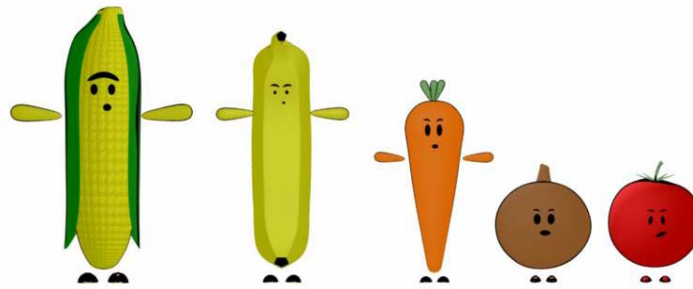


The tomato in a simple environment to test the shader.

A problem: The outline adjusted its thickness after the size of the object.

A solution is mentioned in the chapter concerning modelling techniques.

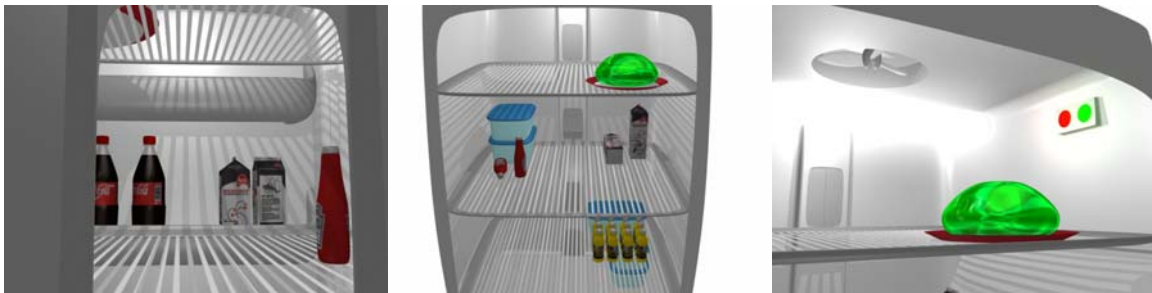
After the beginning of the modelling process, we had some difficulties finding just the right combination of colour, light and shadows to match both the environment and the characters. Some combinations made the whole thing look too bright, because the reflections of the object were too high. Others made the render too dark, and it was impossible to get any useable picture. A lot of this is explained in the “Production in Maya” chapter.



The final characters in 3D. – It still looks like something that also could be drawn on paper.

We tried to make the environment in the refrigerator with a cosy atmosphere, because of the idea of giving the vegetables a good and nice home. We chose to fill the refrigerator with some props to create a more interesting and realistic environment. Things like bottles, milk cartons, lemonade etc. were placed in the fridge to obtain this effect. It does not matter that these are all “dead” things created by humans, because we think of them as “extras”.

The vegetables on the other hand, are products not manipulated by humans but they are nature's own creation, and are therefore still “intact”. Thereby we have chosen to give them life in our cartoon. The corn cob however, is a little bit of both. He is a vegetable manipulated by humans, which is a part of its “curse”, because he this way gets eternal life.



The final rendered environment of the fridge in 3D.

6 The title of the movie

Why does the title contain the moral of the story?

It has been hard to figure out a good and expressive title to our movie, and there were some discussions about where to let out the moral.

At first we called the movie “The corn in the Refrigerator” but in all kinds of ways it sounded wrong and not significant enough. Second of all, the title needs to have something to do with the plot in a better and well considered way. Thirdly, we want to give the audience an idea of the moral already in the beginning. Fourthly and last we tried with the title “Who wants to live forever”. It is a good and telling title, but we do not want to make it all clear in the beginning, we need to hide something for later.

The finally chosen title “Cold Existence” gives the audience an idea of the essence already in the very beginning. By giving them this we avoid the possibility that the audience will spend the rest of the movie’s duration to get the message and to understand our intention with the movie.

It is not the fact that we by pointing out some of the moral in the title ruins the elements of surprises or in any other way reveals all the goodies in the beginning. There are still climaxes during the rest of the cartoon.

”Cold Existence”, explains a lot of the feelings and surroundings that the corn cob experiences in the refrigerator.

The corn cob lives in the fridge which is obviously cold, and this is what most of the audience would hang on to. –But of course this is not the whole meaning of the title.

The title also relates to the immortality of the corn cob, and how his life becomes “cold” and alone, as a consequence of this eternal life.

At last the title is a referral to the corn cobs personality, which is changing as time goes by. He realizes that every friendship he gets involved in will vanish because of the fact that the friend will die. That is why he gets a bit “cold” and uninterested in making new friends, because he can not see the point by doing it anymore.

7 How would you end this movie?

The ending of our animation-movie has been another big topic for discussion in the group. It was hard to agree on one single ending, and there were good arguments to all of the ideas.

Was the ending supposed to be seen from the corn cob's point of view or from the owner of the refrigerator's point of view?

Does the corn cob have to be eaten or thrown away?

Perhaps could we let the corn cob live long enough live longer than the refrigerator itself? And therefore let the corn be inside the refrigerator even though the refrigerator is broke and old and lies in a dumpster.

Or what would happen if we make a so called open ending where we let the corn's destiny in the hands of the viewer?

Our final choice for the ending is to make it open for the audience to make their own final thoughts.

The corn cob is at the end so tired of being immortal. He has seen his friends live and die, while he remains and he decides that he will no longer be a part of the life in the refrigerator, by running to the door every time someone opens it, and in that way get a chance to get eaten.

The last camera-angle we see in the movie is when the corn cob finally gets picked up, from the shelf and out of the fridge. We see the corn cob laying in a palm, and finally a close up of the corn that closes his eyes and smile. –Then the picture fades out to white.

In this way we create an ending that the audience can reflect on. Most people would say to themselves that the corn cob gets eaten, and then he is out of his misery. But actually the hand could also in theory just throw him in the trashcan. –Or any other horrible fate. Any fate besides getting eaten would be horrible for the corn cob. It just wants to die and get peace.

With the ending we have chosen to use, we encourage the audience to think of a happy ending, but it is just as likely that the fate becomes something else.

8 Animation in general

Animation is a wide notion. There are plenty of different ways to explain animation and there are many kinds of animation.

Persistence of vision is a kind of a visual perception-theory which says that the human brain or the eyes hold on to an image for a split second. When a series of frames or pictures flicker, you do not actually see all these frames one by one, but as a continuous stream. In other words you or rather your mind gets the illusion of motion.

In our project we have made a movie with the use of the computer software Maya. I.e. computer animation kept in the cartoon genre.

8.1 Animation techniques

Computer-animation is the way to make animation with the use of a computer.

With this technique you animate by keyframes and not every frame like in other methods.

There are two different ways to use the computer in your animation progress. First, as an assistant in traditional animation, second to act as a brand new tool for animation.

Examples of computer animation could be “A Bug’s Life”, “Finding Nemo”, “Monsters Inc.”, “Toy Story” and others.

Here follows short descriptions of other animation techniques:

Flip-books are an animation method composed of many slightly different drawings. If you flip through the pages, you will see your drawings alive. It is one of the oldest and more known methods for animation.

Stop motion is actually single frames put together one by one to make a movie. It is used in many different ways and many different mediums. For example cartoons, flip-books, TV.

Old cameras are good examples of this, because a movie was shot one frame at a time in fast speed. It is a method that makes static things seem to be alive.

Stop motion is in other words a movie camera used as a still camera. You move your character slightly, shoot one still picture, move the character a bit more, and shoot a picture and so on. When you have shoot all still pictures you need, you run them all one picture after the other and here you have the illusion of movement.

Today most of any animation is made with computer technology and other digital methods.

“King Kong” is one of the good examples of stop motion animation.

Animation methods that uses stop motion are pixilation, puppet animation and claymation.

Pixilation is a method where real persons are used in an animated movie using stop motions.

Example of this technique could be “Song Bird” by Hee Holmen. The movie is made of still pictures, and the steps between the frames are bigger than it is seen in other animation methods. It is though easy to understand the story after all.

Rotoscoping is a sort of animation to a movie. You start with a finalized movie, and reproduce this to your own drawings. You work frame by frame, and draw the movie-clips in your own kind of way. This technique gives more flow in the movement and it is an easier way to animate a movie in case you are not a professional cartoonist.

Puppet animation is an animation method were 2- or 3-dimensional puppets/figures are used in stead of hand drawings in for example stop-motion.

Motion capture is a great way getting the realistic movements for your character. It is a way of controlling your animation. If you as an example want to produce an animation with a realistic hockey player it could be useful to explore how the players move while playing.

Another option could be to place a number of diodes on the player's body joints and plug these wires into a computer. It is now easy with a little help from different software to capture the hockey player's movement in action, and you are able to make a realistic animated character.

Zoetrope is a visual toy invented in the 1820s to illustrate animation. It is formed as a cylinder and its inner surface is made of drawn pictures. (These pictures could for example be the ones from the flip book.) When the cylinder is put on a stick and rotated you will see the drawn figure is alive so to speak. This impression of motion depends a lot on the persistence of vision, because it is a matter of how close the pictures is put together and how fast the cylinder is rotated.

Claymation has to do with animating clay-figures. It is the same principles as in the puppet animation method and a bit like pixilation, where you place your clay characters, shoot a picture, move them a little and shoot again. All your frames are put together and you have your clay-animated movie.

Examples of this kind of animation could be the famous "Chicken Run"

Cut-out animation is one of the oldest animation techniques. In this you cut out your shapes and characters in paper or other materials and afterwards do a kind of stop motion. Place your cut out parts, shoot a picture, move the parts a bit, shoot a picture and so on. By having all body- and stage-parts cut out one time, you can use the same parts again and again. It is thereby easier than by drawing one picture after the other because of the recycling.

Examples could be "The Tocher", "South Park".

9 Animation-theories used in our case

9.1. Introduction

When we first had our final character design in place, we started to consider the different techniques for animations, and which was appropriate to use in our animation.

We had to consider the arms, legs, walking, facial expressions etc. because our characters are groceries, like tomatoes, onions etc. We could actually do this just as we like to but it should not be too unrealistic though.

We have discussed a lot to figure out how to make the different “body”-parts for our characters. It should not be too difficult to animate in Maya because of our expertise, but we would also still have a great “cartoony” result.

As mentioned in the chapter “From Concept Art to 3D” page 8, “Bert” was a huge inspiration for us, and we made the limbs a bit in the same style as this movie. We have for that reason studied the way “Bert” is animated.

The next parts of the report are an explanation of the ways we animated our characters. Our result is more or less a mixture of some theories from the book “Animators Survival Kit”, impressions from “Bert” and of course, our own requirements and ideas.

9.2. Walk cycles

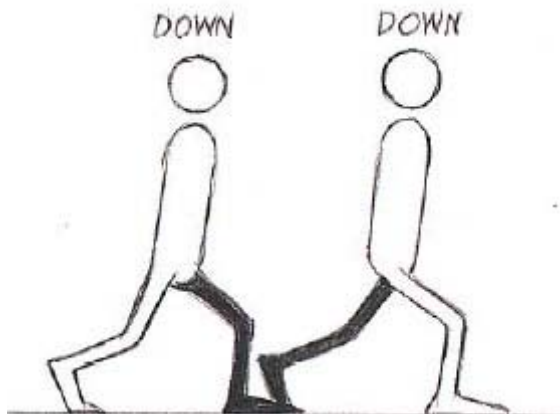
To give our characters a gait that does seem realistic is very hard. We used a lot of time to avoid the “3D-robotic” animation, which is when a character walks almost like a robot, without any kind of life.

The first problem we got was the walk. The thing with our characters, is that they have a very little (or none) amount of joints. This made it a bit more difficult to animate a good walk. We figured out that when we needed joints to make a nice walk, (our characters practically only have a pair of feet, no legs and knees etc), we could try bending the feet a little.

This did, in practically all situations needed, solve the problem. It became “cartoony” instead of robotic, and helped a lot to bring more life to the characters.

Next problem was the remaining body, when walking. When we had to animate the tomato, onion or any other of our sphere-shaped characters, we did not have any hips, shoulders, neck etc. to help us make the illusion of walking. The only thing we had was a sphere with feet.

We found that the so called “Down Position” method was very handy in our case. This method was invented by Art Babbitt (a colleague of Richard Williams, director of “Who Framed Roger Rabbit” and author of the book “The Animators Survival Kit”).



The Down Position is a method used for walk cycles, where you first make all the down positions (the position where the character have all the weight on one of the feet), and duplicate them.

The good thing about the use of this method is that it is perfect to use in Maya. Maya have some very good features similar to, or just like “Down Position”. The way we use it in Maya, is that we make a position of a limb, and then we can make Maya duplicate or “remember” this movement for later in the walk using the timeline.

This is how we made our walk cycles simple and effective.

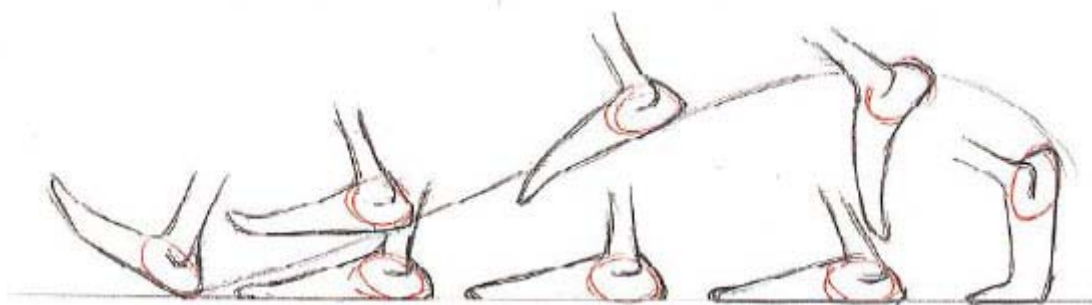
There was though something missing to make the animation smooth and unproblematic.

9.3. Heels and Toes

At first, we agreed that the walk cycle looked okay, but it was not perfect at all. There were some details with the heels and toes that could make it a lot better. As mentioned before we had a lack of joints to help us make life-like animation, because of the character design.

It is the smaller details that make the difference.

This means that we should animate the heels and toes more detailed, to make it look more realistic.



We were forced to focus on how the heels in reality are the leading part of the foot, and if it was not thought through deep enough, the feet just hang along.

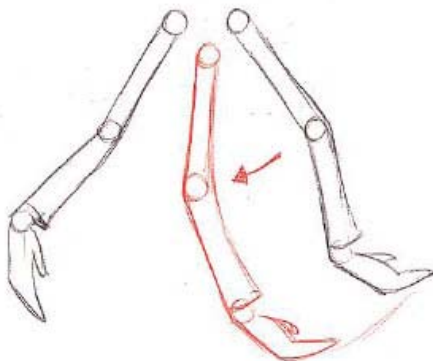
The heels are the central point for animation of feet. First we animated the heel, until it looked well enough. After this we made the foot bend, to make the illusion of toes on the character. This is used a lot and with great feedback, because of the lively quality.

9.4. The Arms (and the secret of Break Points)

It was hard to figure out the reason why we could not animate the arms better than we could. This was why we went over some theories of how to make it look good. And that was where we found out about Break Points.

Break points are a certain method of animation of the arm. Our characters only have little “drop-shaped” arms, so it was a little more difficult for us to animate them properly. The break points helped though.

When animating an arm, we need to invert the joints when the character was in motion. This means that when one of our characters moves the arms, we bend the place where the elbow should have been, in the opposite direction.



This kind of movement is not possible in real life, but in animation it is perfect for giving us that illusion of movement. Even if it is not possible in reality, we use this technique to make it look more real, which it does.

As mentioned, we only had the possibility of bending. We did not have any kind of joints to bend, making the character look like it had an elbow. This is why we bend the

shape of the arm. The harder the arm was bend the more it looked like an elbow or any other of the joints.

9.5. The Flexibility (The use of Breakdown)

The flexibility of our characters is one of the most important issues in our animation. It helps us to express the feelings of the characters even more, and we could avoid some problems such as:

- The “King Kong” effect, which means everything on the screen moving at the same amount. This makes the animation look bad.

- Flashing effect, which is the direct opposite of the “King Kong” effect. This is where everything is flashing around on the screen, and makes the picture look very confusing.

These assumed problems are the reason why we agreed to make use of the breakdowns in situations where we found it necessary. You have to be careful that you do not ruin the impression of life, because we found out that sometimes our characters actually got too much energy using this method.

The method is called “Breakdown Drawings”, or just “Breakdown”, and it deals with the frames between the “Extremes” in animation. Extremes are the word used to describe the start and stop position of a transition in flexibility. It could be an extreme happy face, extreme sad face, extreme sleepy face etc.

Illustrated in a lighter way:

Extreme – Breakdown - Extreme²

If we want alterations in these expressions, we could just make the ordinary frames in between. But actually the Breakdown can be used to make it a lot more interesting. The making of the ordinary frames in between helps the viewer to almost predict the

² Animator’s survival kit by Richard Williams

following expressions, which is not wanted at all. If you use the method in a wrong way you find the animation boring and conventional.



The Breakdown works by putting a new, different expression in the frames between the extremes. This means that the viewer gets a whole different perception of the cartoon. The breakdown provides us with a lot more possibilities, for how to get more life. The method has been described as a possibility for making an action within action.

But as mentioned before, do not use this method in every animation. In some of the sad scenes, where the corn cob loses his friends, the breakdown method actually made it look a little too extreme.

9.6 Facial Expressions

We have experimented a lot with the facial designs. After watching “Bert”, we agreed that the facial style made in our animation, should be a bit like that. It is simple, and it makes the characters look a lot more like something that came from a piece of paper, instead of a computer. Even though the faces are primitive without plenty of modelling and colours we have achieved very great expressions.

It was not exactly easy to give the characters the look that we wanted them to have. Because of the style of the faces we had chosen, we once again ran into this problem that we did not have the expected vital parts needed to make a good animation.

Like the characters do not have elbows, knees, legs etc. they also do not have chins, cheeks etc.

Therefore our design of facial expressions needs to be made only with mouth, eyes and eyebrows. –above all this, these facial parts were only dots and lines (because of the cartoony-style).

In this ‘facial expression-progress’ we deleted a lot of eyes and eyebrows. And we used a lot of our time getting the right one for every characters mood and situation.

After all we managed to deal with it quite well. Actually the only thing we need to do was to make the expressions as an extreme. That means that sometimes we lifted an eyebrow a little more than normally possible to emphasize the atmosphere and this fitting situation.

This kind of overdoing is one of the good things making cartoons, because it is legal to exaggerate movement to strengthen the viewer’s experience and adventure by watching these cartoons.

10 Music and sound in cartooned animation

A great movie could have things like a story, music, sounds, dialogue and acting. In our case the dialogue is missing. With that in mind we have to strengthen the other factors to make the final production as good as it would have been with dialogue, or even better.

Music and sound is a very great agent in cartoons. Try to mute your television when watching a cartoon. What happens and how does it work?

It is not the same experience without sound, because the sound is such a strong effect. Then try to have a cartoon turned on with sound, while doing something else. Even if you do not really attend to the cartoon you still get the point, and you have a pretty good idea what is happening after all.

The use of sound and music is very important for the mood in the movie, and it helps us to identify us with the act and action.

*“When you look at cartoons from the 1940s and 1950s, one of the primary roles of the music is to enhance the comedic affect of the story or gag. Thus, the composer must make it his or her business to make the music funny and, at the same time, still effective as a soundtrack.”*³

Carl Stalling was one of best composers of cartoon-music. He made music to cartoons which had a supposed relation to the subject in the cartoon.

It is a great art to make music to cartoons, because you have to trigger different moods that fit every scene in the movie. For example, if the mood has to be very depressed and sad, you have to fit the music for this. This means that the music has to be made after the movie is done, to get it right and to make the audience’s sympathy.

You so to speak have to tell your story more or less through the music.

³ <http://www.awn.com/mag/issue2.1/articles/goldmark2.1.html>

In our situation we have to be very deep and careful when making the music and sound to our cartoon, because of the no-dialogue issue. The sounds are therefore a large support for the acting (body language).

An example of cartoons with no dialogue could be “Road Runner” which is about a coyote that wants to catch the fast Road Runner. We all know that this will never happen but he does not give up.

There is in this case absolutely no problem figuring out what this cartoon is about even though the dialogue is missing. And the acting is so well drawn that children get the point also. In fact, it would surely not be funny at all if you made the coyote and the Road Runner talk.⁴



⁴ <http://www.awn.com/mag/issue2.1/articles/goldmark2.1.html>

11 Production in Maya

We have selected a scene, where the tomato is switching the light on, to describe the workflow in creating the animation in Maya. The scene contains a refrigerator, which is the main environment. There are three characters and one prop.

11.1 Modelling

The models are based on the concept art and all the 3D elements are modelled in separate files. The reason for this is the increased flexibility, because we are using the same elements in others scenes, which helps us to easily customize the different scenes.

We used Nurbs-modelling to create all the objects mainly because it allow us to create round shapes fast and easy, a bonus by using nurbs is the ability to convert nurbs to polygons.

If we look at how the environment is modelled it is simply a circle curve, where we have moved the vertex point in the component mode to get a square shape. The curve is then extruded to make it three-dimensional. Now we have the basic model but it still laces the opening for the door, and the ends at the top and bottom needs to be closed.

The door opening is created in the same way as the walls. The two surfaces are now intersecting and we can trim the walls to have a hole where the surfaces overlap. The top and

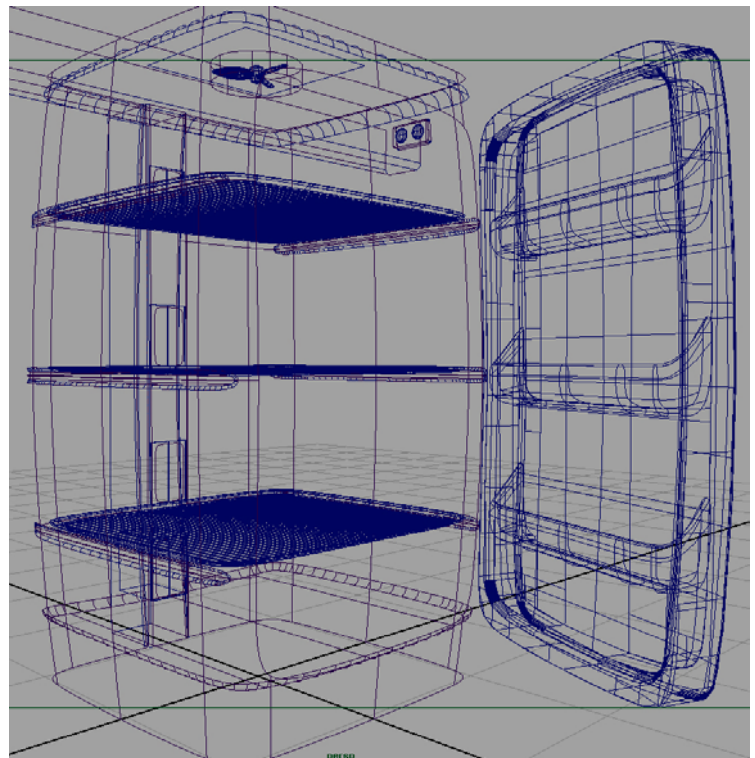


Figure 1: Wire frame model of environment

bottom is created in the same fashion. The bevel between the walls and the top was created with circular fillet to make a nice rounded connection between the two surfaces. All the other elements connected to the fridge were modelled using the technique above. The characters are either created from simple spheres or by revolved curves. They have then been shaped in the component mode by moving vertices. Lofting different curves to get the desired shape created the feet. Scaling and modifying spheres in the component mode created the face.

The prop was also modelled by the same principle by revolving and lofting curves to the right shape.

Next is the creation of the shader network, which enables us to colour the objects.

11.2 Shaders

This part of the process is very important because no matter how fine the models are, if they have a wrong or bad shader it is going to look fake and horrible. For our animation we want to achieve a cartoon look. The two main requirements for this is an outline going round the edge of the characters. The fill colour inside the outline is also important. It

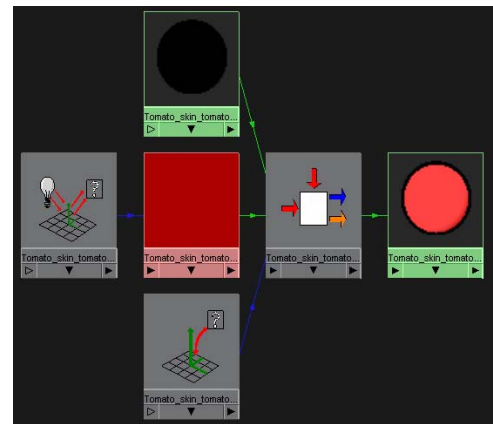


Figure 2: Tomato Shader network

is very uniform and in steps of minimum two colours, that represent base colour and shadow.

This is achieved by using Lambert shaders for the outline. The base colour is made with a ramp texture that imports light information from a surface luminance. The separate elements are connected to a condition, it is here the relationship between the outline and the base colour is controlled. The condition gets a signal from a sample info based on the normal of the object. A surface shader displays the output. See figure 2 for details.

We had some problems with the outline of the

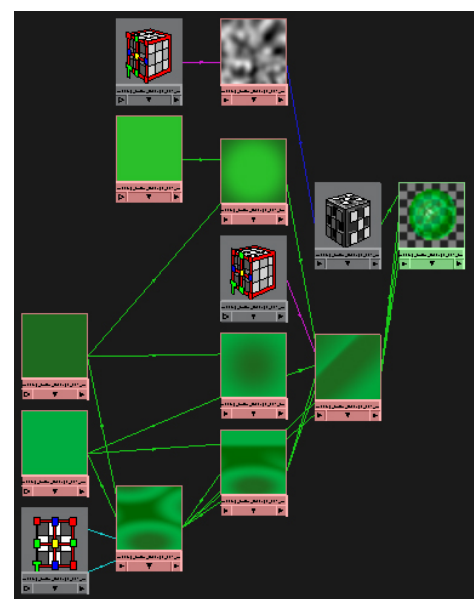


Figure 3: Jelly shader network

material. When applied to different objects sizes the outline varied in thickness and we wanted the outline to have an even outline around all objects. The solution we came up with was to create copies with different outline values.

Another challenge was to create the jelly shader that would have different colour and density to emphasize the jelly dynamic structure. Our first thought was just to create a green transparent shader, but it was hard to see the structure of the jelly object. The thing we needed was to add more depth to the material. We came up with a solution where three-layered texture produced the different colours for the material. They were connected to four-ramp texture in order to produce the depth and density. The ramp texture is connected to an envcube with a place3Dtexture to locate the maps in three-dimensional space. A volume noise also with place3Dtexture is used to emphasize the surface. A blinn shader displays the output. See figure 3 for details.

The shaders for the refrigerator are just simple blinn and phong shaders with a colour and a grey value in the ambient colour tab. We use the ambient colour to fake global illumination⁵ light effect.

The last shader type is the glow shader used to create the strip light in the top of the refrigerator. We used a simple lambert shader, where we have activated the glow intensity under special effects, and the incandescence value is a dark grey just to give it a little extra.

Models and shaders can not be displayed without a proper light solution though.

11.3 Light

Creating the light gave us two alternatives, the first is to use mental ray where the light is created based on how real light bounce from one object to another, so in our case a refrigerator normally has one light source in the top. This method has one advantage, it look real. The downside is that it takes a lot of computer power and time. For this reasons we are going for an alternative solution.

We are using three-point light placed in order to illuminate

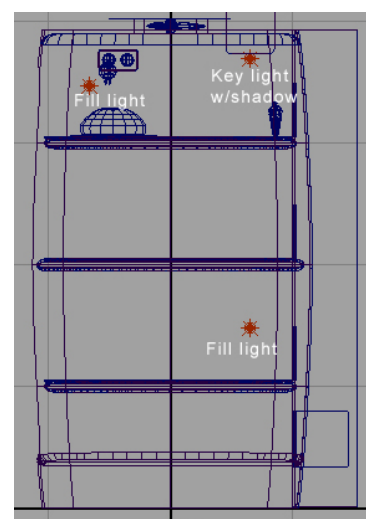


Figure 4: Light setup

⁵ Global illumination is when CG light is calculated based on real world physics, like mental ray in Maya.

the scene right. One key light in the top just under the strip light model, and shadow is activated for the key light. The two other fill lights is played to illuminate the lower parts of the scene and the fill light have the shadow disabled, see Figure 4 for details.

Now that the graphical style is created it is time to animate the characters.

11.4 Rigging

The characters are all rigged the same way, although the tomato and onion have no arms. The joints for the skeleton are made of joint chain like knee and angle joint etc. The joints for the legs and arms are first connected to the spine after the skinning has been applied. Otherwise the joints in the legs and arms influence the body surface, and we want them to be separate.

We chose to use IK⁶ to control the motion of the legs and arms. The clever thing by using IK is that we can control for instance a leg from only one locator, this makes it easier to animate the leg and tweak in the graph editor. Another smart addition to the leg control is a toe attribute that enables us to easily change the flexibility in the toe to get a soft foot motion, refer to figure 5.

For the spine we have used IK spline to get the right spine motion, because IK spline is controlled by a CV curve, its vertex points can be moved, -refer to figure 6, to change the joint position. For each vertex point we have linked a cluster, which gives us the ability to change the shape.

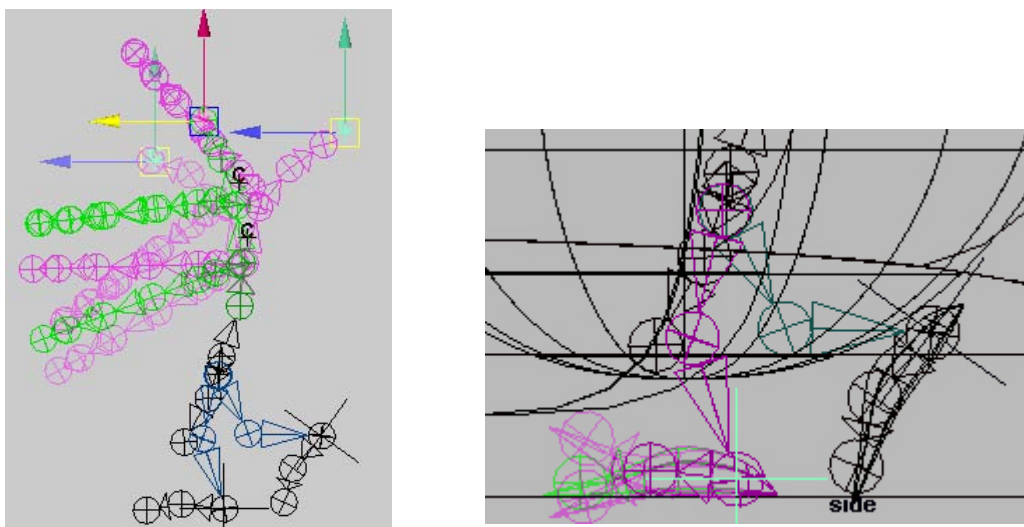


Figure 5: Toe control

⁶ Inverse Kinematics

11.5 Animation

In this scene the tomato is going to switch the light on in the refrigerator by jumping on the jelly in order to reach the light switch.

We have broken the scene into to parts, where we have the motion of the jelly in the first part and the jumping tomato in the second part.

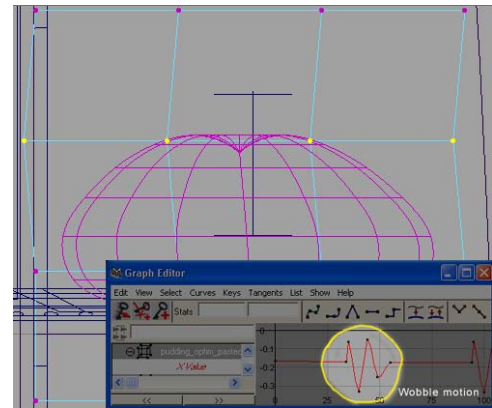
Part one the jelly is first animated to make it easier to make the tomato jump. We have created a real pudding to study the properties of the motion, when

compressed and wobbling. The up and down motion is controlled by a squash deformer that can be compressed to simulate the jelly being squeezed and expanded, -refer to figure 7. The compressing down and up, is about 24 frames. When we get to the last frame in the expansion a sideways motion is started to get a wobbling motion from side to side. This is animated by using a lattices deformer. Where the top of the jelly is moving in back and forth and the bottom is stationary, takes 21 frames. The wobbly motion is animated to decay after the fourth wobbles, - refer to figure 8.

Animating the tomato jumping on the jelly is inspired by how a diving board affect the

motion of the body, where the knees get bent and the torso compressed when the board have maximum deflection. To display the energy stored in the compressed jelly, when released the tomato's body gets full extended and the feet is drawn out by the acceleration. Refer to figure 9.

Again with the impact of the switch the body stops, but the feet are still in a forward motion. When the switch turns on, the tomato makes a back flip where the feet are angled in 90 degrees to the body to increase the speed in the rotation. When landing on the jelly again the compression of the body is happening once more. The final back flip is just like



Figur 6: Squash deform

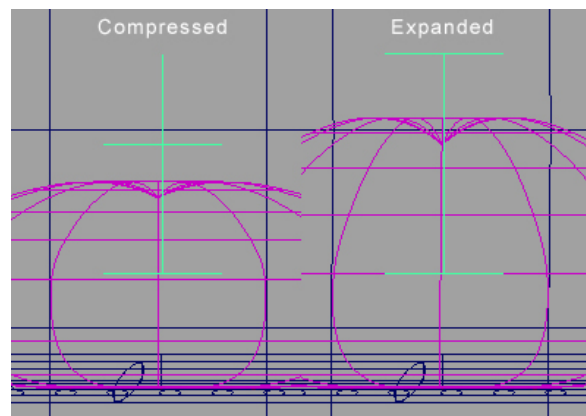


Figure 7: lattices

the first, except that, when the feet have contact with the ground the body and feet slides backwards to show the force of impact.

The facial expression is animated with blend shape. In our case we have one standard face where the blend shape is disabled, and three faces that can be simultaneously blend in between, enabling us to express different behaviours. Everything from eye closing to mouth movement is animated in this fashion.

When we have animated how the rough motion is created we use the graph editor to tweak the animation by moving the various graphs for the selected channels. Another smart feature we have used to track the walk and jump motion is applying motion trail that creates a line representation of how the motion flow is occurring. Together the motion trails and graph editor enables us to animate the characters fast and with the body language.

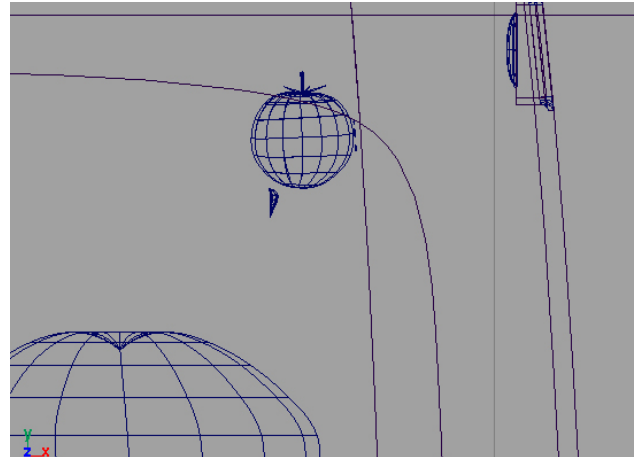


Figure 8: foot angle

12 Conclusion

The whole animation process has been very exiting and educational and we have found out which abilities we one by one possess.

Our animated movie lasts approximately 2-3 minutes, which were our goal.

During the process we used Maya from Alias | Wavefront and Adobe After Effects. We also used various literatures like “Animators Survival Kit” and different articles from the internet.

We made the animation without any dialog, which means that our characters do not have any recognizable kind of speech. Instead we learnt how to improve the body language of our characters, which replaced the communication in situations needed.

We learnt and made use of several traditional animation techniques, like Break Points, Breakdown etc. and how to use these in Maya.

We are all very glad to see the final product and it is a bit surprising that we have accomplished to end up with such a great movie in the short given time.

13 References

Books:

Richard Williams, *The Animator's Survival Kit*, published by Faber and Faber Limited 2001.

Alias Wavefront, *Learning Maya | Foundation*

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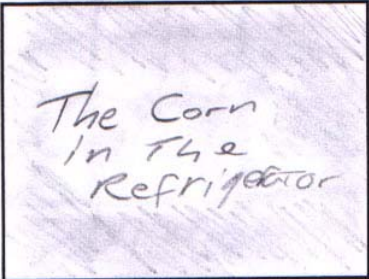
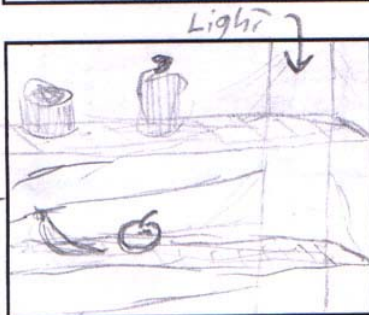

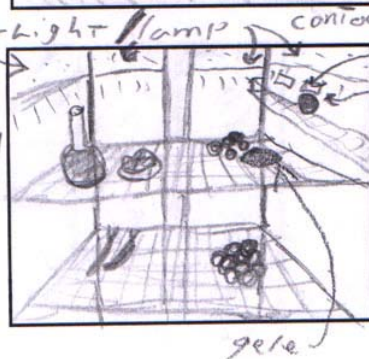
http://sweb.cityu.edu.hk/smash/5304/cut_out.html

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14 Appendix

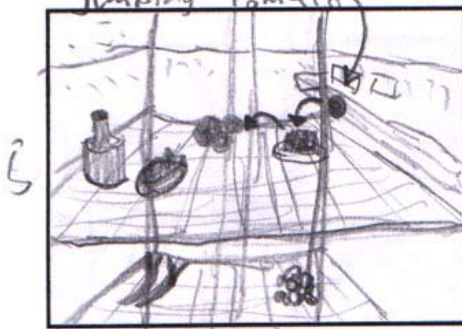
Appendix 1.

Title: The Corn in The Refrigerator Scene 1

1		<p>Action: <u>Title fade in/out</u></p> <p>SF: <u>/o</u></p> <p>Sound: <u>Piano music</u></p>
2		<p>Action: <u>Refrigerator door being opened, by owner. New stock being filled in, and the door being closed. The corn is among the new groceries!</u></p> <p>SF: <u>doorsound, fillin-effects.</u></p> <p>Sound: <u>Piano music</u></p>
3		<p>Action: <u>The door is closed, and the light disappears. The groceries is making noise.</u></p> <p>SF: <u>preceling, giggles, other activity. -"Boing"-sound.</u></p> <p>Sound: <u>Piano music</u></p>
4		<p>Action: <u>The light comes on, and it turns out, that a tomato turned on the light. -By jumping on some gele.</u></p> <p>SF: <u>click-sound</u></p> <p>Sound: <u>Happy Piano music.</u></p>

Title: Jumping Tomatoes

Scene 1

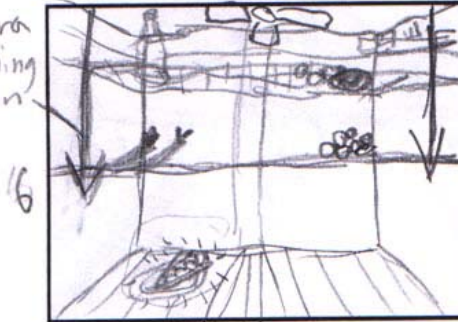


Action: The "lamp-tomato" jumps down to the others, and they all starts to play.

SF: "Boing" - sound, "childrensnoise"

Sound: Happy piano music

Camera Panning down

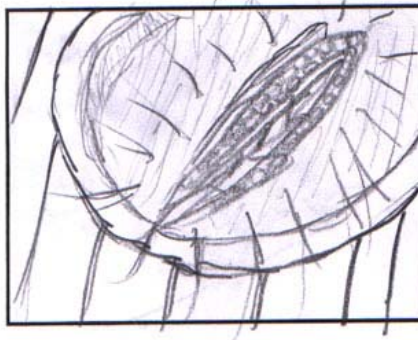


Action: Camera turns down to the low shelf, where the sweet-corn is lying. - And its glowing.

SF: "childrensnoise" is fading.

Sound: Piano music.

7



Action: Close-up on the glowing sweet corn.

SF: "glowing noise" (fade in/out)

Sound: Piano music.

8



Action: The playing Tomatoes are looking on the sweet corn, from above, with CURIOSITY.

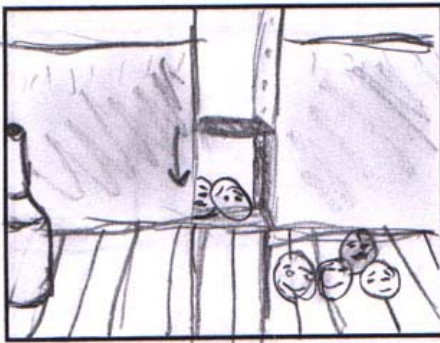
SF: "uhm", "hmm", "uh" ?

Sound: Piano music

Title: _____

Scene 1

9

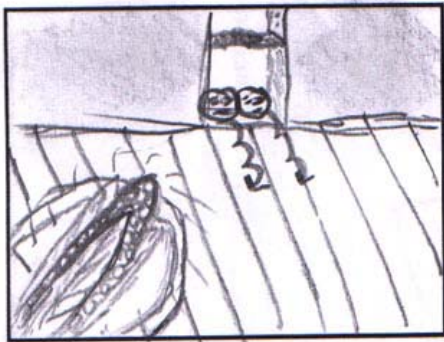


Action: Some of the tomatoes takes the elevator down to the sweet corn.

SF: "elevator sound"
"button click"

Sound: Piano music

10

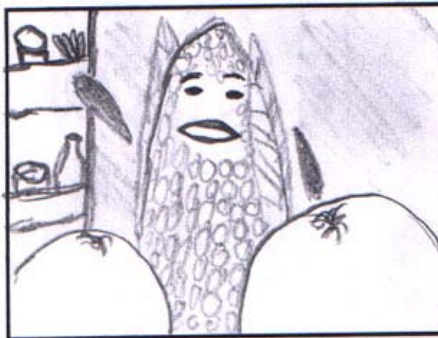


Action: The tomatoes gets out of the elevator, at the bottom.

SF: "Door opening"
"Ding"

Sound: Piano music

11



The sweet corn greets them.

Action: _____

SF: "humming"-sound.

Sound: Piano music

12



Action: The tomatoes invites the sweet corn to join them on the top-level.

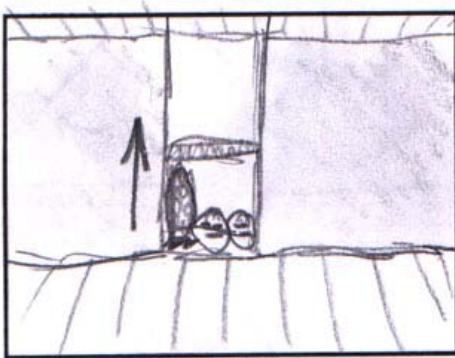
SF: "mumbleing"

Sound: Piano music.

Title:

Scene 1

13

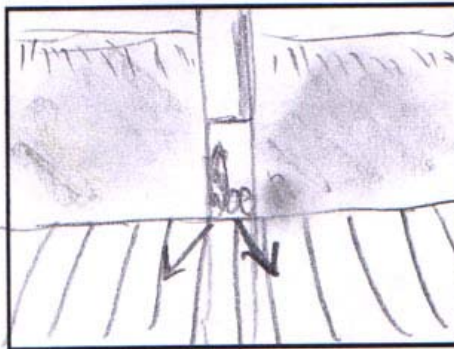


Action: They take the elevator to the top-shelf.

SF: "elevator" sound.

Sound: Piano music - happy

14

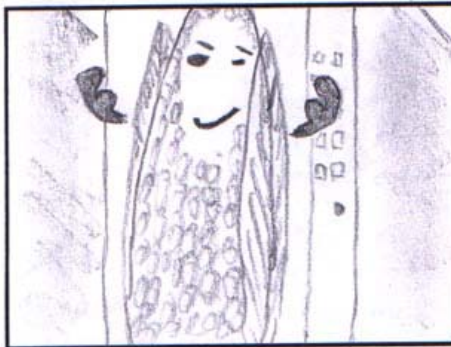


Action: They arrive at the top shelf and get out of the elevator.

SF: "elevator door open" "ding" sound.

Sound: Piano music - happy.

15

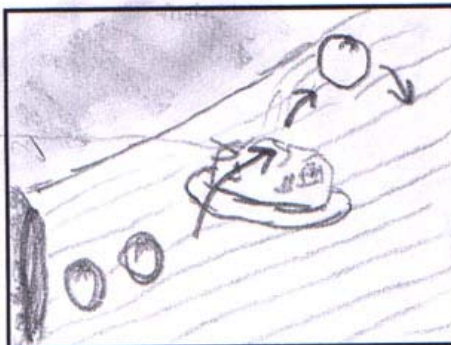


Action: The sweetcorn starts showering off.

SF: "squeek" from muscles

Sound: Piano music - Happy.

16
gele



Action: They therefore take turn on who's best in gele jumping.

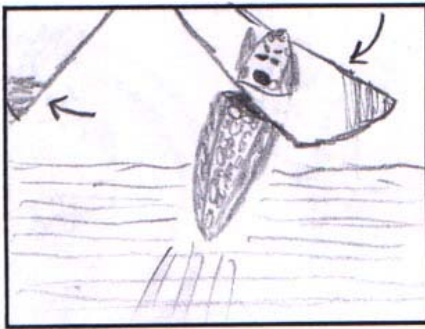
SF: "Boing" "yahoo" noise

Sound: Piano music - Happy

Title:

Scene 1

17

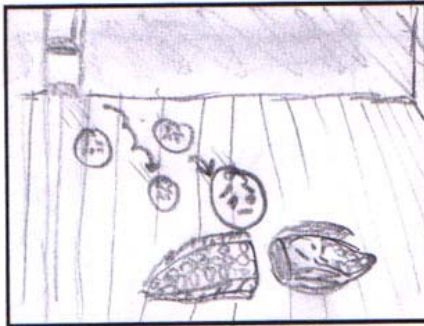


Action: BUT in the sweetcorn's second jump, IT HITS the cooling fan.

SF: "Snap"-sound.

Sound: Dramatic music.

18

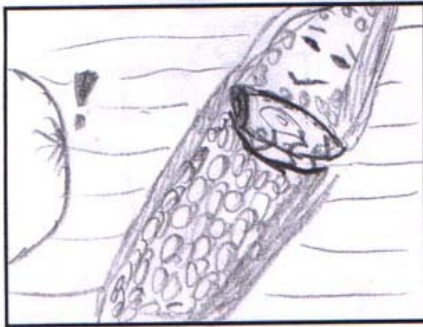


Action: The tomato rushes to his aid.

SF: "Quick boings"

Sound: Sad music.

19



Action: - BUT the sweetcorn starts re-generating itself.

SF: "electricity"

Sound: dramatic music

more dramatic

20



Action: The tomatoes are disgusted and tells the sweetcorn to leave. - The picture fades out.

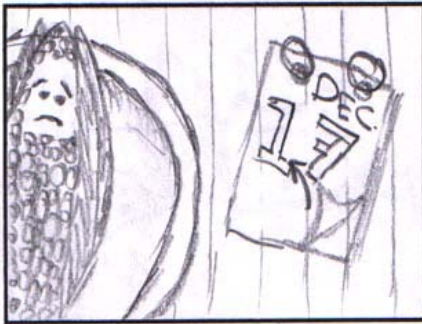
SF: "Humming"

Sound: Sad music

Title:

Scene 1

21



Action:

The days pass... and the sweetcorn are alone.

SF:

none

Sound:

Sad music

combines

22



Action:

one day he can hear the tomatoes jumping on the gele. - But he can also hear the one of them get inside the gele. The tomatoes start to scream.

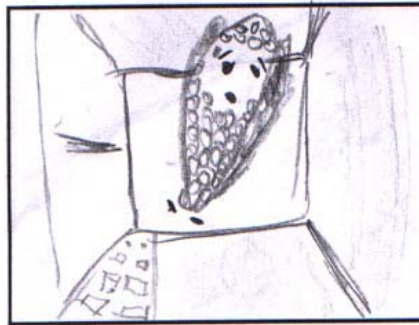
SF:

"Boing" "slurp" "Scream"

Sound:

Dramatic music

23



Action:

He quickly takes the elevator to the top-shelf.

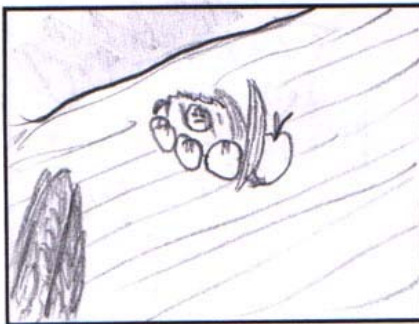
SF:

"elevator"

Sound:

Dramatic music.

24



Action:

When he arrives he see a tomato trapped inside the gele. - The other vegetables are gathered around it.

SF:

"Humming" "Scream"

Sound:

Dramatic music

Title:

Scene 1

25

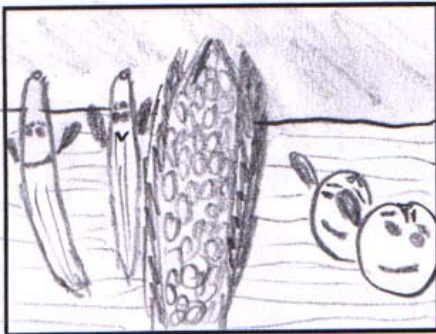


Action: The sweetcorn pushes them aside and pulls out the trapped tomato.

SF: "SWAP"

Sound: Dramatic music.

26

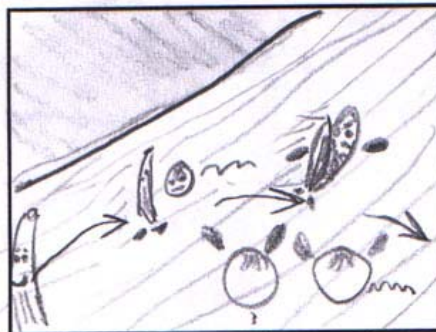


Action: All cheers!

SF: "burray" "cheer"

Sound: Happy music.

27

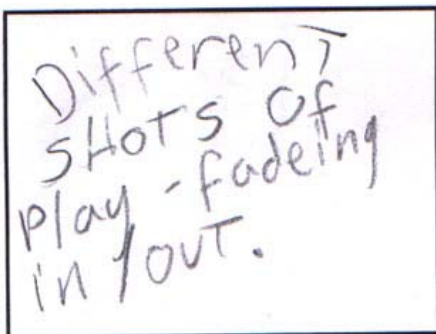


Action: They become friends and start to play.

SF: "cheering" "childplay"

Sound: Happy piano music.

28



Action: Different shots of them all, playing.

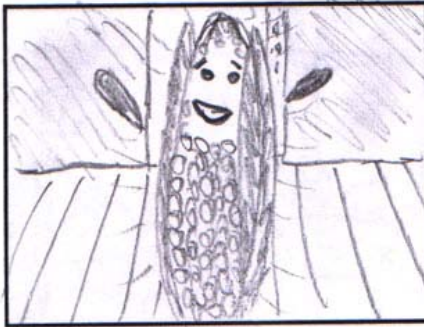
SF: "cheer'n" "children"

Sound: Happy piano.

Title: _____

Scene 1

29



Action: One day the sweetcorn come to play.

SF: _____

Sound: Happy piano music

hopper
rundt
om mejs
og bliver
ældre...
30



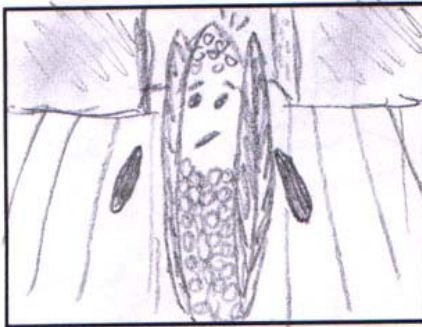
Action: - BUT he, sees that all his friends are getting old...

SF: _____

"old humming"

Sound: Sad music.

31



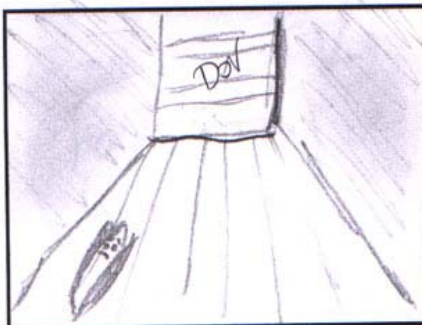
Action: He takes a look on himself and can't understand why he isn't getting old.

SF: _____

"Uh?"

Sound: sad music.

32



Action: Time goes, and, one day he's alone again.

SF: _____

Sound: sad music

Title:

Scene 1

33

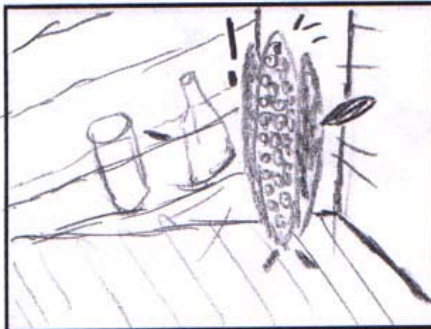


Action: Time passes by, and we see new groceries getting replaced in fast forward.

SF: "Fast forward" sound

Sound: sad music.

34



Action: He finally tries to get eaten, because he's tired of immortality.

SF: "yells"

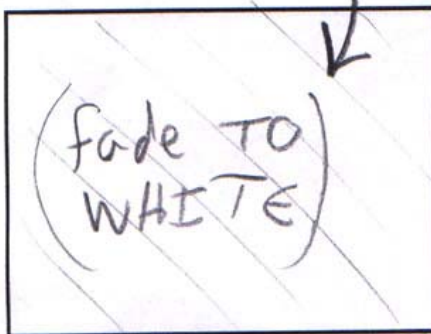
Sound: sad music.



Action: - Until, finally, one day a hand takes him out and the final picture is the sweet corn smiling with closed eyes, and then a bright light.

SF: sound = "zoom"?

Sound: Quiet piano music.



Action: THE END

SF: WHO WANTS TO LIVE

Sound: FOREVER